

# How Many of Each Kind?

Abby and Bing Woo own a small bakery that specializes in cookies. They make only two kinds of cookies—plain and iced. They need to decide *how many dozens* of each kind of cookie to make for tomorrow.

The Woos know that each dozen of their *plain* cookies requires 1 pound of cookie dough (and no icing), and each dozen of their *iced* cookies requires 0.7 pounds of cookie dough and 0.4 pounds of icing. The Woos also know that each dozen of the plain cookies requires about 0.1 hours of preparation time, and each dozen of the iced cookies requires about 0.15 hours of preparation time. Finally, they know that no matter how many of each kind they make, they will be able to sell them all.

The Woos' decision is limited by three factors.

- The ingredients they have on hand—they have 110 pounds of cookie dough and 32 pounds of icing.
- The amount of oven space available—they have room to bake a total of 140 dozen cookies for tomorrow.
- The amount of preparation time available—together they have 15 hours for cookie preparation.

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Why on earth should the Woos care how many cookies of each kind they make? Well, you guessed it! They want to make as much profit as possible. The plain cookies sell for \$6.00 a dozen and cost \$4.50 a dozen to make. The iced cookies sell for \$7.00 a dozen and cost \$5.00 a dozen to make.

The Big Question is:

*How many dozens of each kind of cookie should Abby and Bing make so that their profit is as high as possible?*

1. a. To begin answering the Big Question, find one combination of dozens of plain cookies and dozens of iced cookies that will satisfy all of the conditions in the problem.  
  
b. Next, find out how much profit the Woos will make on that combination of cookies.
2. Now find a different combination of dozens of cookies that fits the conditions but that yields a greater profit for the Woos.

This problem was adapted from one in *Introduction to Linear Programming, 2nd Edition*, by R. Stansbury Stockton, Allyn and Bacon, 1963, pp. 19-35.